## PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1898.

By Professor Malcolm McNeill.

*Mercury* is an evening star, and toward the end of the month it remains above the horizon an hour or more after sunset, and may be seen under favorable weather conditions. On November 19th it is in conjunction with *Venus*, passing 1° 18′ north of the latter. As the planets then set less than an hour after the Sun, it will be difficult to see them, unless the horizon is very free from cloud and haze.

*Venus* is still an evening star, but is rapidly approaching inferior conjunction with the Sun, and after the middle of the month it will not be easy to see it. At the beginning of the month it has just passed its period of greatest brilliancy.

*Mars* rises earlier, before 9 o'clock, at the end of the month. It moves about 8° eastward during the month through the constellation *Cancer*. On November 11th it passes less than half of the Moon's diameter south of the fifth-magnitude star *η Cancri*. Its distance from the Earth decreases more than 20,000,000 miles during the month, and at the close is about 77,000,000. Its brightness increases about sixty per cent.

*Jupiter* is a morning star, and rises from one to three hours before sunrise according to the time of the month. It is in the eastern part of the constellation *Virgo*, and moves about 6° eastward and 2° southward during the month.

*Saturn* is still an evening star, and is not far enough away from the Sun toward the end of the month to be seen. It is in conjunction with *Venus* on November 23d, passing 4° to the north of the latter; but both planets are too near the Sun to be easily seen.

*Uranus* is in conjunction with the Sun and changes from an evening to a morning star on November 25th, but remains too near the Sun to be seen.

*Neptune* is above the horizon nearly the entire night, and is on the border line between *Taurus* and *Gemini*.

### December.

The winter solstice comes and winter begins December 21st, 11 A.M. P. S. T.

*Eclipses.* There will be two eclipses during the month. The first is a partial eclipse of the Sun on December 13th. It is visible only in the South Pacific Ocean, and its greatest magnitude is only a little more than one-fortieth of the Sun's diameter.

The second is a total eclipse of the Moon on December 27th, and will, in part at least, be visible throughout the entire country. Total eclipse will end at $4^h\ 27^m$ P.M. Pacific time, just about the time the Moon rises in the extreme western part of the United States.

*Mercury* is an evening star at the beginning of the month, and comes to greatest eastern elongation on December 3d. For the first ten days of the month it sets an hour or more later than the Sun, and may be seen in the evening twilight on a clear evening. After that, it rapidly approaches the Sun, and passes inferior conjunction on December 21st, becoming a morning star. At the end of the month it rises an hour and a half before sunrise.

*Venus* passes inferior conjunction with the Sun on December 1st, and becomes a morning star. By December 10th it rises more than hour before sunrise, and after that it may be seen in the morning twilight.

*Mars* is getting into better position for evening observation, rising before 9 o'clock on December 1st, and more than two hours earlier on December 31st. It moves eastward about 1° until December 10th, and then moves westward 3° and northward 2° before December 31st. Its line of backward motion is about 2° north of the line it traced moving eastward in November. On December 29th, it passes about the Moon's diameter north of the fifth magnitude star $\gamma$ *Cancri.* During the month its distance from the Earth diminishes about 14,000,000 miles, and is about 63,000,000 at the close. Its brightness increases about fifty per cent. during the month.

*Jupiter* rises about two hours earlier than during the corresponding period of November, at 2:20 A.M. on December 31st. It moves about 3° east and south in the constellation *Virgo.*

*Saturn* is in conjunction with the Sun on December 6th, and becomes a morning star. It remains near the Sun, but may possibly be seen toward the close of the month in the morning twilight.

*Uranus* is a morning star also, but its faintness precludes its being seen until its distance from the Sun is greater.

*Neptune* comes to opposition with the Sun on the evening of December 14th.

## Phases of the Moon, P. S. T.

| | | H. M. | | H. M. |
|---|---|---|---|---|
| Last Quarter, | Nov. 6, | 6 28 A. M. | Dec. 6, | 2 6 A. M. |
| New Moon, | Nov. 13, | 4 20 P. M. | Dec. 13, | 3 43 A. M. |
| First Quarter, | Nov. 20, | 9 5 A. M. | Dec. 19, | 7 22 P. M. |
| Full Moon, | Nov. 27, | 8 39 P. M. | Dec. 27, | 3 39 P. M. |

## The Sun.

| 1898. | R. A. H. M. | Declination. ° ′ | Rises. H. M. | Transits. H. M. | Sets. H. M. |
|---|---|---|---|---|---|
| Nov. 1. | 14 27 | — 14 32 | 6 34 A.M. | 11 44 A.M. | 4 54 P.M. |
| 11. | 15 7 | — 17 31 | 6 45 | 11 44 | 4 43 |
| 21. | 15 48 | — 20 0 | 6 57 | 11 46 | 4 35 |
| Dec. 1. | 16 31 | — 21 52 | 7 8 | 11 49 | 4 30 |
| 11. | 17 14 | — 23 2 | 7 17 | 11 54 | 4 31 |
| 21. | 17 59 | — 23 27 | 7 23 | 11 58 | 4 33 |
| 31. | 18 43 | — 23 5 | 7 26 | 12 3 P.M. | 4 40 |

### *Mercury.*

| | | | | | |
|---|---|---|---|---|---|
| Nov. 1. | 14 58 | — 17 35 | 7 15 A.M. | 12 14 P.M. | 5 13 P.M. |
| 11. | 16 0 | — 22 17 | 7 57 | 12 37 | 5 17 |
| 21. | 17 3 | — 25 9 | 8 34 | 1 1 | 5 28 |
| Dec. 1. | 18 1 | — 25 48 | 8 56 | 1 20 | 5 44 |
| 11. | 18 34 | — 24 12 | 8 42 | 1 13 | 5 44 |
| 21. | 18 3 | — 21 23 | 7 20 | 12 3 | 4 46 |
| 31. | 17 25 | — 20 8 | 5 56 | 10 45 A.M. | 3 34 |

### *Venus.*

| | | | | | |
|---|---|---|---|---|---|
| Nov. 1. | 16 54 | — 27 57 | 9 57 A.M. | 2 11 P.M. | 6 25 P.M. |
| 11. | 17 2 | — 27 36 | 9 24 | 1 40 | 5 56 |
| 21. | 16 54 | — 25 58 | 8 28 | 12 51 | 5 14 |
| Dec. 1. | 16 32 | — 22 58 | 7 13 | 11 50 A.M. | 4 27 |
| 11. | 16 10 | — 19 34 | 5 59 | 10 50 | 3 41 |
| 21. | 16 2 | — 17 17 | 5 2 | 10 2 | 3 2 |
| 31. | 16 10 | — 16 35 | 4 28 | 9 30 | 2 32 |

### *Mars.*

| | | | | | |
|---|---|---|---|---|---|
| Nov. 1. | 8 13 | + 21 28 | 10 13 P.M. | 5 30 A.M. | 12 47 P.M. |
| 11. | 8 27 | + 21 1 | 9 50 | 5 5 | 12 20 |
| 21. | 8 38 | + 20 44 | 9 23 | 4 37 | 11 51 A.M. |
| Dec. 1. | 8 45 | + 20 43 | 8 51 | 4 5 | 11 19 |
| 11. | 8 48 | + 21 2 | 8 13 | 3 28 | 10 43 |
| 21. | 8 44 | + 21 42 | 7 29 | 2 46 | 10 3 |
| 31. | 8 35 | + 22 41 | 6 36 | 1 58 | 9 20 |

### *Jupiter.*

| | | | | | |
|---|---|---|---|---|---|
| Nov. 1. | 13 33 | — 8 32 | 5 19 A.M. | 10 50 A.M. | 4 21 P.M. |
| Dec. 1. | 13 56 | — 10 42 | 3 52 | 9 15 | 2 38 |
| 31. | 14 6 | — 12 24 | 2 20 | 7 37 | 12 54 |

*SATURN.*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov. 1. | 16 | 37 | — | 20 | 38 | 9 | 7 A.M. | 1 | 54 P.M. | 6 | 41 P.M. |
| Dec. 1. | 16 | 52 | — | 21 | 7 | 7 | 25 | 12 | 10 | 4 | 55 |
| 31. | 17 | 7 | — | 21 | 30 | 5 | 44 | 10 | 27 A.M. | 3 | 10 |

*URANUS.*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov. 1. | 16 | 1 | — | 20 | 31 | 8 | 30 A.M. | 1 | 17 P.M. | 6 | 4 P.M. |
| Dec. 1. | 16 | 9 | — | 20 | 52 | 6 | 42 | 11 | 27 A.M. | 4 | 12 |
| 31. | 16 | 16 | — | 21 | 11 | 4 | 53 | 9 | 37 | 2 | 21 |

*NEPTUNE*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov. 1. | 5 | 36 | + | 22 | 0 | 7 | 35 P.M. | 2 | 54 A.M. | 10 | 13 A.M. |
| Dec. 1. | 5 | 33 | + | 21 | 57 | 5 | 34 | 12 | 53 | 8 | 12 |
| 31. | 5 | 30 | + | 21 | 55 | 3 | 29 | 10 | 48 P.M. | 6 | 7 |

## ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off left-hand limb as seen in an inverting telescope.)

| | | | H. | M. | | | | H. | M. | |
|---|---|---|---|---|---|---|---|---|---|---|
| I, D, | Nov. | 14. | 5 | 55 | A.M. | I, D, | Dec. 7. | 6 | 5 | A.M. |
| II, D, | | 15. | 5 | 40 | A.M. | II, D, | 10. | 2 | 36 | A.M. |
| III, R, | | 19. | 3 | 21 | A.M. | I, D, | 15. | 2 | 27 | A.M. |
| I, D, | | 23. | 2 | 17 | A.M. | II, D, | 17. | 5 | 9 | A.M. |
| III, D, | | 26. | 5 | 23 | A.M. | I, D, | 23. | 4 | 21 | A.M. |
| III, R, | | 26. | 7 | 18 | A.M. | I, D, | 30. | 6 | 14 | A.M. |
| I, D, | | 29. | 4 | 11 | A.M. | I, D, | Jan. 1. | 12 | 42 | A.M. |
| | | | | | | III, D, | 1. | 1 | 9 | A.M. |
| | | | | | | III, R, | 1. | 3 | 3 | A.M. |